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Immature Stages and Adult Female of the Lampyrine Species, *Lucidina okadai* NAKANE et OHBAYASHI, 1949 (Coleoptera, Lampyridae, Lampyrinae) from Gifu, Central Honshu, Japan

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Abstract The first and last instar larvae, pupa and adult female of the lampyrine species, *Lucidina okadai* NAKANE et OHBAYASHI, 1949, from Gifu Prefecture, central Honshu, Japan, are described and illustrated for the first time. It is confirmed that both the elytra and hindwings of the adult female are shortened and reduced. It is also proved beyond doubt that the unidentified firefly of the genus *Lucidina* reported by YANAGIHARA (1923 a, b) belongs to this species.

Introduction

In the summer of 1923, two accounts of a firefly species were given by YANAGIHARA (1923 a, b). It was only named "Kobane-botaru" in Japanese, with no Latin specific name. This Japanese name means a "short-winged firefly" or a "small-winged firefly" in English, doubtless derived from the short wings in adult female. Unfortunately, however, the two simple reports are promptly considered by prominent firefly researchers of those days to be preliminary accounts of "merely deformed individuals of *Lucidina biplagiata* MOTSCHULSKY" (OKADA, 1931) or "only individuals which failed in emergence to the adult of *L. biplagiata*" (KANDA, 1934, 1935), and the truth has been veiled till now.

NAKANE (1983), the first author of the original description of the lampyrine firefly, *Lucidina okadai* NAKANE et OHBAYASHI, 1949, gave a brief comment that "YANAGIHARA's Kobane-botaru might be the same as *L. okadai*." After a detailed investigation of a habitat of "Kobane-botau" newly discovered in Gifu Prefecture, OHBA *et al.* (1996) surmised that "YANAGIHARA's Kobane-botaru" is truly the female individuals of *L. okadai*.

At last, breeding the larvae collected from the known habitat in Gifu Prefecture in

2003, we have succeeded in obtaining adult females of *L. okadai*, long unsolved problem since YANAGIHARA's time, and the truth of his reports was confirmed after about eighty years.

In this paper, the larval and pupal stages of *L. okadai* obtained in a breeding process will be reported for the first time.

Materials and Methods

The materials examined in the present study are described under the heading of "*Materials examined*" following the titles of respective stages. For dissection, head including antennae and mouth parts, legs, female genitalia, etc., were removed from the body, mounted on slide glasses with glycerol or Canada balsam, observed through optical microscope (OLYMPUS CH–2, max. magnification ×1,000) and sketched with the aid of an attached drawing tube. The other external characters were observed and sketched with a stereoscopic microscope (OLYMPUS SZH10, max. magnification ×140) equipped with a drawing tube. The abbreviations used herein are as follows: BL – length of body, from anterior margin of frons to hind margin of 8th abdominal tergite; HW – maximum width of head, across eyes; PL – length of pronotum, along mid-line; PW – maximum width of pronotum; EL – length of elytra; EW – maximum width of left elytron, mainly basal part; EHW – humeral width of elytra; HTL – length of hind tibiae; IK – I. KAWASHIMA.

Descriptions

First Instar Larva

(Figs. 2–3, 6, 8, 10, 12)

Materials examined. 25 larvae, from Gifu-shi, Gifu Pref., central Honshu, V–2003 (eggs collected from emerged female *in vitro*), VI–2003 (hatched), bred by IK.

Coloration. Whole body including appendages less pigmented.

Head capsule dark brown in anterior half of dorsal side, grayish brown on ventral side, clearly paler than dorsum; posterior half milky white on both dorsum and venter; lateral ocelli black; antennae almost milky white except for distal flagellum; flagellum tinged with pale yellowish brown; mandibles yellowish brown; almost all the other mouth parts pale yellowish brown. Pro-, meso- and metanota moderately darker gray or grayish brown, longitudinal mid-lines and a pair of keels on both sides milky white throughout three thoracic tergites. First to 7th abdominal tergites also gray to grayish brown; 8th and 9th ones clearly paler than those of preceding thoraces and seven abdominal segments, yellowish brown to pale brown; ventral surface of body including legs clearly paler than dorsal side, almost constantly milky white, sometimes tinged with pale grayish; only sternite of prothorax tinged with moderately darker, grayish

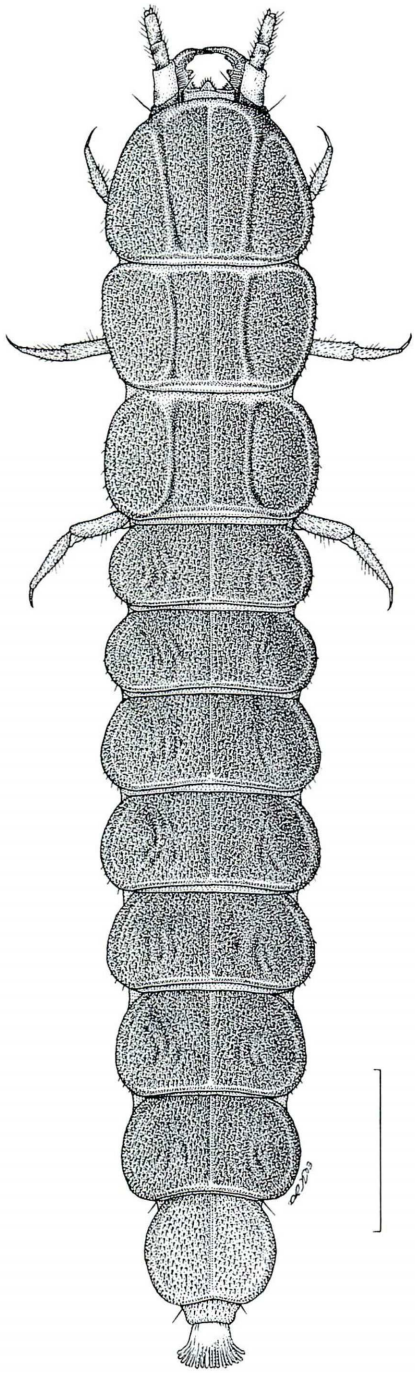
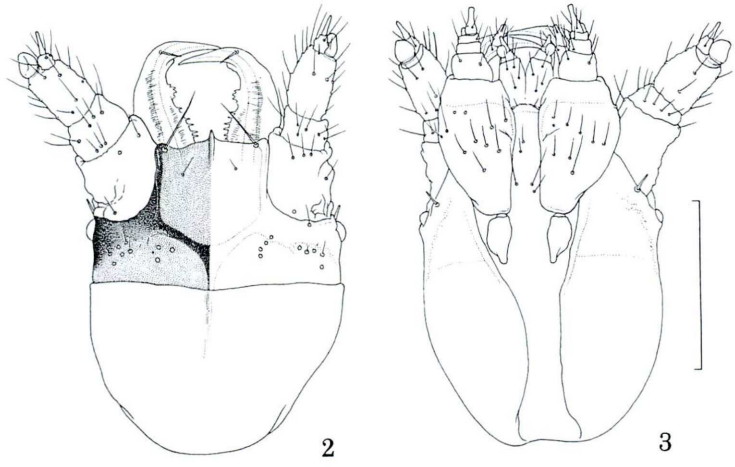


Fig. 1. Last instar larva of *Lucidina okadai* NAKANE et OHBAYASHI, 1949; habitus, dorsal view. Scale: 1.0 mm.



Figs. 2–3. First instar larva of *Lucidina okadai* NAKANE et OHBAYASHI, 1949; head, dorsal view (2), ventral view (3). Scale: 0.5 mm.

brown; membraneous area not showing fresh pink even in living state.

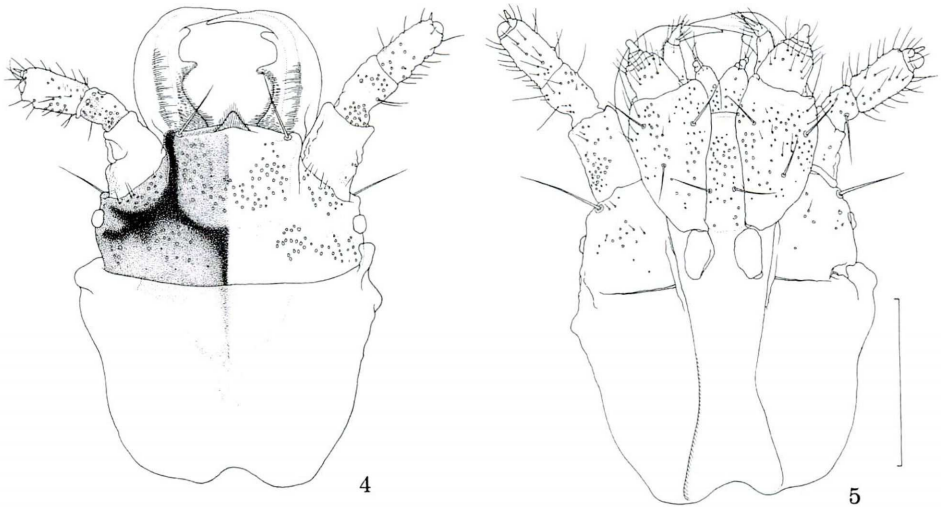
External morphology. Body campodeiform, elongate, almost parallel-sided, slightly flattened dorso-ventrally.

Head capsule (Figs. 2, 3) prognathous, subquadrate with widely arcuate and rounded posterior part, moderately flattened dorso-ventrally, widely and completely open on venter, only retractable within prothorax leaving posterior half when alive; anterior margin almost transversely straight, bearing a process at the middle, with a pair of long spines just inside both angles. Epicranial suture present as well as frontal sutures that extend to bases of antennae as brownish pigmented areas.

Labrum and clypeus not recognized. Lateral ocelli (stemmata) (Figs. 2, 3) very small and rounded lens-like, attached to the lateral sides of head capsule, just behind antennal bases.

Antennae (Fig. 12) three-segmented, partially retractable into articulating membraneous base, originating in apico-lateral areas of head capsule; scape robust and widest, clearly shorter than pedicel, scattered with setae on dorsal and ventral surfaces; pedicel cylindrical, the longest, scattered with setae and relatively long spines on dorsal and ventral surfaces, each carrying a semi-globular sensillum, which is slightly longer than the length of minute flagellum; flagellum very short and minute, moderately triangular, each with several spines and a pointed stick-like sensillum at the apices.

Mandibles (Fig. 6) symmetrical, strongly falcate, each with an inner channel opening subapically on exterior edge just before the apex; two pairs of retinacula present on about middle length of mandibles, and with six to seven minute teeth at the basal side of retinaculum in this instar; inner sides of basal portions densely covered



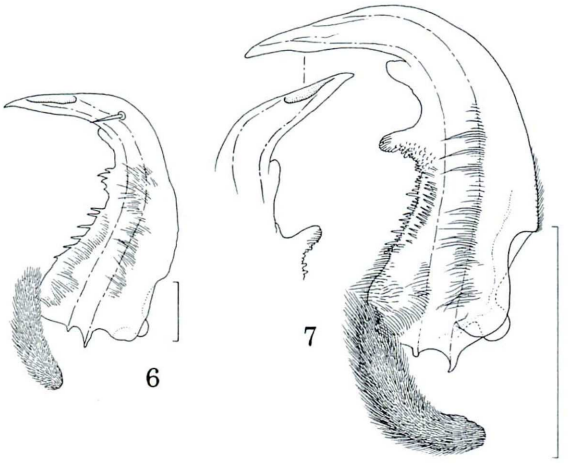
Figs. 4–5. Last instar larva of *Lucidina okadai* NAKANE et OHBAYASHI, 1949; head, dorsal view (4), ventral view (5). Scale: 0.5 mm.

with brush-like setae; upper surface with a single row of moderately long setae in median areas, each with a very short but robust spine on upper surface at distal third.

Maxillae (Fig. 8) large and robust; cardo moderately elongate, fusiform; stipes largest and widest, ventral surface scattered with setae and several very long spines; galea two-segmented; apical segment elongate conical with pointed apex, which bears a minute pointed sensillum at the apex; lacinia completely absent; maxillary palpus four-segmented; basal segment widest and largest, gradually narrowed towards subconical distal segment, whose apex is distally rounded.

Labium (Fig. 10) narrow as a whole; basal margin of mentum not recognized, completely fused to membraneous area, with a pair of long spines at about basal third; prementum short and roundly bilobed, with the sides arcuate and expanded externally; anterior portion with a deep cleft in the center; distal area with a pair of long robust spines; labial palpus two-segmented, basal segment wide but clearly shorter than the distal; distal segment elongate conical with minutely rounded apex, bearing a globular and a short stick-like sensillum on venter.

Pronotum semicircular or moderately elongated semicircular, a little longer than the maximum width, with a pair of very low and vague keels on both sides of mid-line, sides subparallel and/or weakly divergent anteriad; mesonotum transversely trapezoidal; sides arcuate and weakly convergent posteriad, with a pair of keels as in pronotum, feebly incurved and/or almost parallel; metanotum transversely rectangular, with arcuate sides, and with a pair of keels continuous from pro- and mesonota, almost parallel and exteriorly curved in basal portions. Coxae (as sclerites of body trunk) very large and stout.

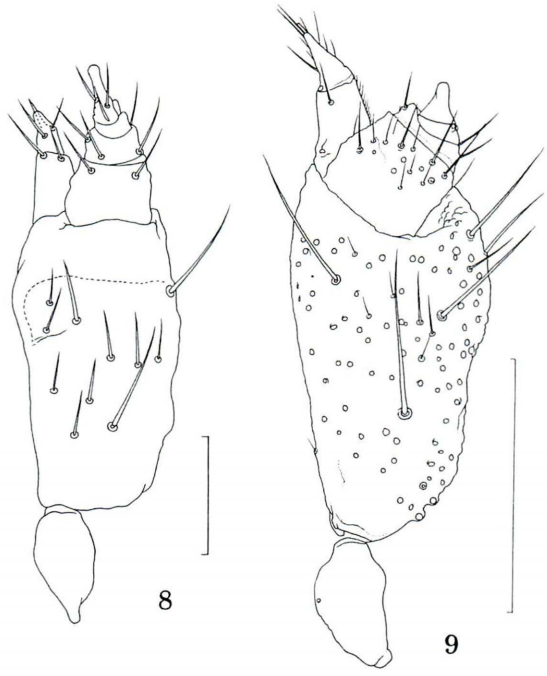


Figs. 6–7. Larval mandibles of *Lucidina okadai* NAKANE et OHBAYASHI, 1949; dorsal view, first instar larva (6), last instar larva (7). Scale: 0.1 mm (6), 0.25 mm (7).

Legs (Fig. 15) four-segmented; all pairs similar in general shape and size to one another; trochanters relatively large, obliquely attached to femora; femora cylindrical, upper and lower margins parallel, each with a long spine on ventral side, obliquely cut off at distal margin; tibiae simple but longest, clearly tapered towards the apices; tarsunguli small with pointed apices, slightly incurved, each with a minute seta on venter nearly at bases.

Abdomen 10-segmented; 1st to 7th tergites transverse and subrectangular, subdivided by thin but clear sagittal lines, almost the same in general shape and size as one another, sides arcuate and well expanded laterally; 1st to 4th tergites parallel-sided, feebly narrowed towards the distal one from 5th; 8th feebly longitudinally, thick barrel-shaped or short oval; 9th fairly small; 10th very short and formed by a narrow ring, which bears fibrous pygopod (holdfast organ) at the apex, completely covered by the posterior portion of 9th; pleural areas of 1st to 8th subdivided into subrectangular upper sclerites with a spiracle and smaller and rather narrow lower ones; pleural folds in 8th to 10th almost completely fused to sternite, not recognized; 1st to 7th sternites transverse and subquadrate with rounded posterior corners, each with two pairs of robust spines; the exterior pairs moderately long, arising from rounded postero-lateral corners; the inner pairs short, arising from both sides of middle line; 8th sternite recognized only by the hind margin, but with two pairs of spines; venters of 9th and 10th bearing two or three spines, which never form a transverse row; postero-lateral portions of 8th pleural regions with a pair of spotted luminescence organs.

Measurement in mm. Body length (from anterior margin of pronotum to 9th abdominal end) ca. 1.50–1.75; HW (maximum width of head capsule) 0.15–0.16; PL 0.19–0.20; PW 0.24.



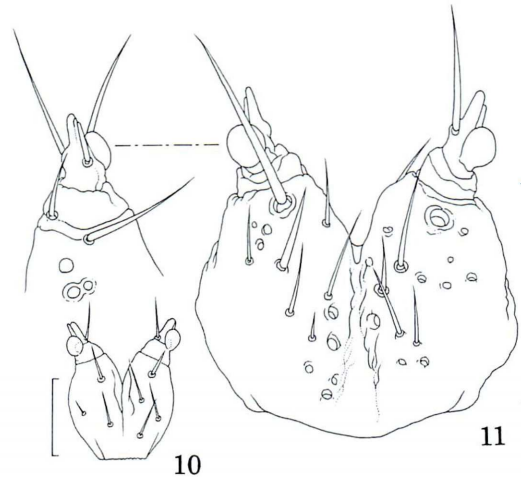
Figs. 8–9. Larval maxillae of *Lucidina okadai* NAKANE et OHBAYASHI, 1949; ventral view, first instar larva (8), last instar larva (9). Scale: 0.2 mm (8), 0.25 mm (9).

Last Instar Larva

(Figs. 1, 4–5, 7, 9, 11, 13–14, 16, 19)

Materials examined. 17 larvae, collected from the same locality as for the 1st instar larval materials, IV–2003, staff of Chugai Technos Co. Ltd. leg. & bred by IK.

Coloration. Anterior half of head capsule blackish brown on dorsal side, brown on ventral side, clearly paler than dorsum; posterior half of head capsule milky white on both dorsum and venter; lateral ocelli black; antennae almost milky white except for distal flagellum; flagellum tinged with dark brown: scape and pedicel almost milky white but partly tinged with dark brown; mandibles reddish brown; cardo, galea and maxillary palpi pale brown; stipes brownish; mentum and prementum fairly tinged with dark brownish, especially in the central areas; labial palpi pale brown to milky white. Pro-, meso- and metanota moderately dark to blackish brown, longitudinal midlines and a pair of keels on both sides milky white throughout three tergites of thorax. First to 7th abdominal tergites also dark to blackish brown; 8th and 9th ones clearly paler than the ones of the preceding segments, pale yellow to yellowish brown; ventral surface of body clearly paler than the dorsal side, almost constantly pale brown to brown; spiracles milky white; legs pale brown to yellowish brown from trochanters to tarsunguli; claws moderately tinged with reddish brown; membraneous area remark-



Figs. 10–11. Larval labium of *Lucidina okadai* NAKANE et OHBAYASHI, 1949; ventral view, first instar larva (10), last instar larva (11). Scale: 0.1 mm (10), 0.25 mm (11).

ably fresh pink when alive, changing to milky white after fixed in ethyl alcohol.

External morphology. Body (Fig. 1) campodeiform, elongate, almost parallel-sided, slightly flattened dorso-ventrally. Number and density of setae and spines clearly and fairly increasing on the whole body surface including mouth parts and appendages. Basic structure of body including all appendages essentially the same as that of 1st instar larvae, main differences from the latter as described below.

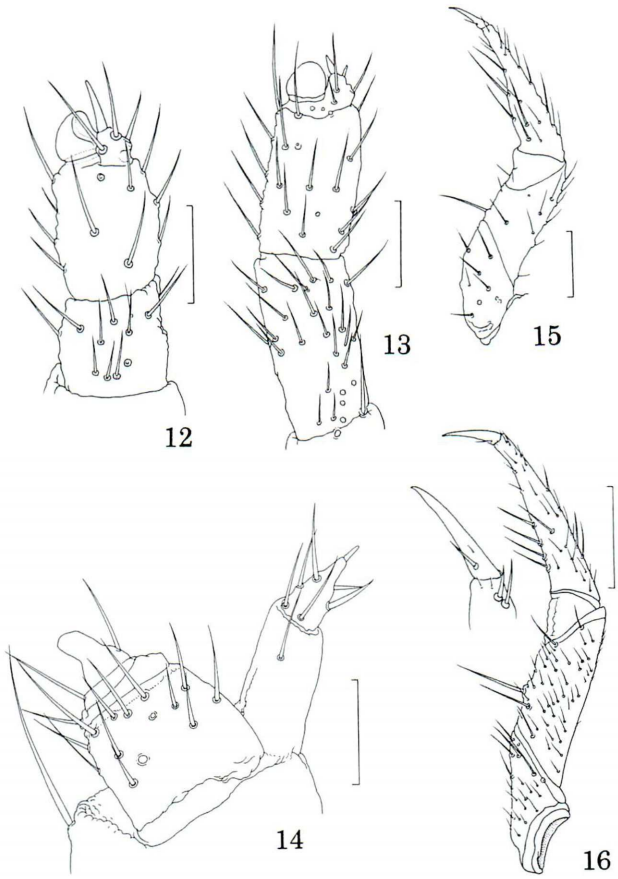
Central process on anterior margin (nasal area) of head capsule right triangle, clearly wider than that of 1st instar larva (Fig. 4); a long spine arising from ventral side of head capsule, between lateral ocelli and basal margin of antenna, much longer than in 1st instar larva; spine-like sensillum arising from distal tip of antennal flagellum relatively short (Fig. 13); globular sensillum arising from distal tip of flagellum relatively small (Fig. 13); two pairs of retinacula on the inner margin of mandible clearly more developed (Fig. 7); distal segment of maxillary palpus relatively short, with more rounded apices (Figs. 9, 14). A pair of longitudinal keels on dorsal surface of pro-, meso- and metanota fairly clearer than in 1st instar larva. Relative length of femora in all legs longer and slenderer (Fig. 16).

Measurement in mm. Body size of the last instar larva individually variable. Body length (from anterior margin of pronotum to 9th abdominal end) ca. 8.00–12.00; HW (same as in 1st instar larva) 0.80–0.85; PL 1.00–1.10; PW 1.20–1.25.

Pupa

(Figs. 17–18, 20)

Materials examined. 9 pupae, from the same locality as for larval materials,



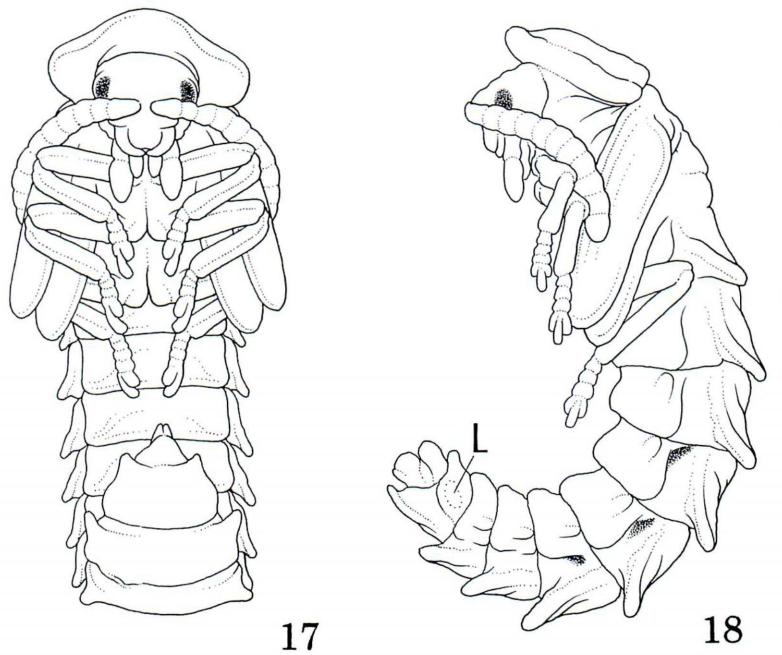
Figs. 12–16. Larval left antenna, apical portion of right maxilla and right hindleg of *Lucidina okadai* NAKANE et OHBAYASHI, 1949; dorsal view (12, 13), ventral view (14, 15, 16). Scale: 0.1 mm (12, 13, 14), 0.2 mm (15), 0.25 mm (16).

VI–2003 (pupation *in vitro*), bred by IK.

Coloration (*mainly of fresh pupae*). Body creamy white in general; discal area of pronotum and abdominal area sometimes individually tinged pinkish (Fig. 20); spiracular areas pigmented with blackish.

Aged individuals generally stained blackish.

External morphology. Body strongly incurved ventrad. Head relatively small, not much covered by anterior margin of pronotum, easily seen from anterior and dorsal sides; eye areas fairly small, not so bulged laterad; antennae arising from front of eyes, feebly serrate with 11 obvious segments, largely incurved ventrad and folded on both sides of body, exterior side of pro- and midlegs and elytra, extending to the level of hindlegs or clearly beyond that level in male, and reaching the level of hindlegs in female; mandibles small and incurved; maxillary palpus larger, seemingly two-seg-

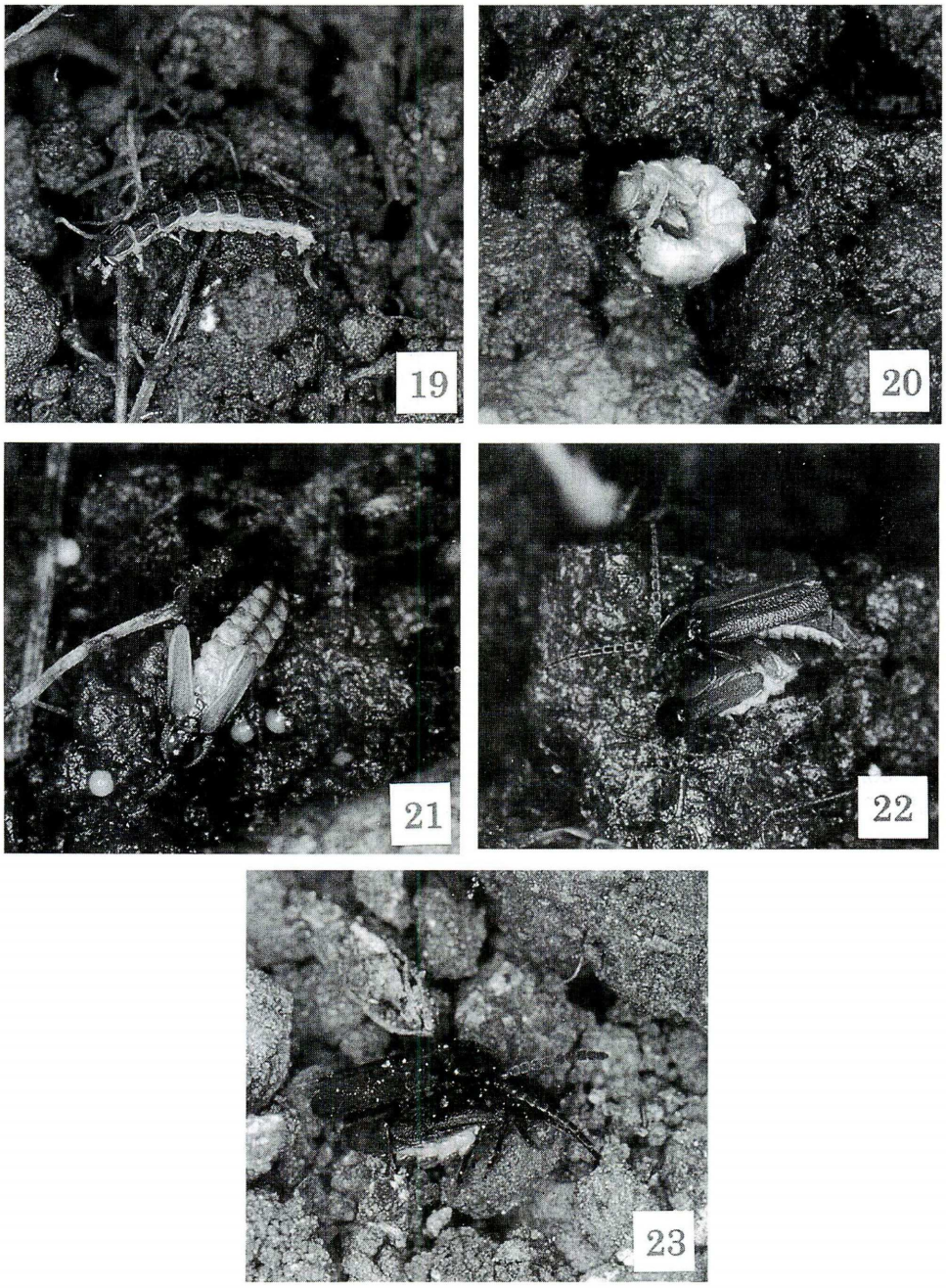


Figs. 17–18. Female pupa of *Lucidina okadai* NAKANE et OHBAYASHI, 1949; ventral view (16), left lateral view (17). Scale: 1.0 mm.

mented, spindle-shaped; labial palpus clearly smaller than maxillary palpus, spindle-shaped in apical segment. Pronotum relatively small, semicircular, almost as long as wide, or a little longer than the maximum width; both meso- and metanota moderately shorter than pronotum, subrectangular, carrying wing sheaths (elytra and hindwings) at sides; apex of each wing sheath rounded; pro- and midlegs fully visible in ventral view; hindlegs largely covered by hindwing sheaths, only basal parts and tarsi being visible in ventral view, but only covered with distal halves of femora and basal halves of tibiae in female. Abdomen 10-segmented, each segment wider than long; sides almost parallel, convergent posteriad in distal two or three segments; 1st tergite without sharply pointed postero-lateral corners; postero-lateral portions of 2nd to 9th tergites bearing moderately pointed and posteriorly directed processes; pleurites probably fused with sternites, not clearly recognized; each sternite fully visible in ventral view, transverse rectangular; a pair of spots of luminescent organs present in lateral areas of 9th sternite (L in Fig. 18).

Measurement in mm. Very variable with individuals, about 4.50–5.50 in the diameter in naturally curled posture.

Notes. The pupa has a pair of luminescent organs in the 9th abdominal segment (L in Fig. 18), which are fairly strongly luminescent when alive (Fig. 20).



Figs. 19–23. *Lucidina okadai* NAKANE et OHBAYASHI, 1949; last instar larva (19), glowing female pupa (20), newly emerged female adult, showing relative lengths of elytra and hindwing (21), mating and mounting (most short-winged female) (22), copulation (23).

Adult Female

(Figs. 21–27, 29–30)

Materials examined. 8♀♀, the same locality as for larval and pupal materials, V～VI–2003 (emerged *in vitro*), bred by IK.

Coloration. Antennae dark brown, almost frosted in flagellar segments; eyes blackish; head capsule black, weakly shiny; mandibles blackish brown, moderately shiny; other portions of mouth parts almost blackish; pronotum black, and moderately shiny, with a pair of vague reddish markings on the disc just after the emergence (Fig. 21); scutellum black and moderately shiny: elytra frosted black; abdominal tergites almost blackish to blackish brown and weakly shiny; penultimate abdominal tergite more or less feebly paler, almost dark brown to blackish brown; last abdominal tergite clearly paler than the other tergites, yellowish brown to brown; all legs clearly paler than body, dark brown including tarsomeres; claws brownish, sometimes reddish stained; ventral surface of body almost blackish brown to black and weakly shiny; abdominal sternites almost the same in coloration as dorsum; all membraneous areas on venter and lateral portions of abdomen fresh pink when alive (Figs. 21–23). Ovipositor not much pigmented, paler brown to whitish with brownish stylus.

External morphology. Individually variable in the body size and general shape, especially the relative length and shape of pronotum.

Head capsule relatively small, wider than long, depressed above, rather minutely punctate on dorsal surface, antennal sockets located between eyes and approaching to each other, interocular space clearly narrower than the width of pronotum; head capsule completely covered by anterior part of pronotum, never seen from dorsal side (Figs. 21–24). Eyes small and globular, weakly prominent laterad. Antennae (Figs. 24–25) clearly shorter than those of male, not reaching the middle of elytra; scape clavate, weakly bent outwards, dilated towards apex, which is the widest; all flagellar segments short and depressed dorso-ventrally, not much dilated towards apices in 4th to 10th (2nd to 8th flagellar) segments, not serrated continuously; distal or 11th segment (9th flagellar) spindle-shaped with rounded apex; relative length of each segment from scape in a specimen as follows:— 8.5 : 4 : 5.5 : 8 : 7.5 : 9.5 : 10 : 10.5 : 9.5 : 10 : 15. Mandibles extremely small with narrowly rounded apices, generally incurved.

Pronotum (Fig. 24) fairly variable individually in general shape, normally short and semicircular, but sometimes longitudinally elongated semicircular, widest before the base, across basal third; maximum width normally a little narrower than the humeral width of elytra, sometimes feebly wider; anterior margin widely arcuate and produced anteriad; anterior to lateral areas widely explanate and reflexed along the margins continuously; elevated disc relatively smooth and/or feebly punctate; both sides to anterior border moderately closely punctate and rugulose; basal margin almost straight or feebly sinuate on each side, narrowly bordered in central part; PW/PL 1.13–1.50 (mean: 1.31); PW/HW 1.53–2.36 (mean: 1.85); PL/PW 0.67–0.88 (mean: 0.77); PW/EHW 0.85–1.10 (mean: 0.94).

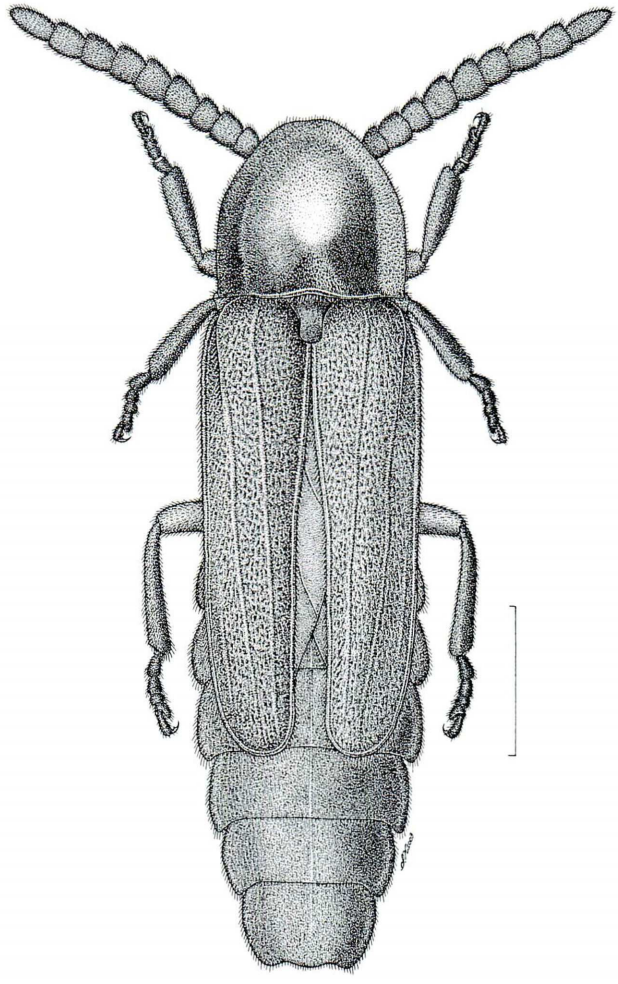
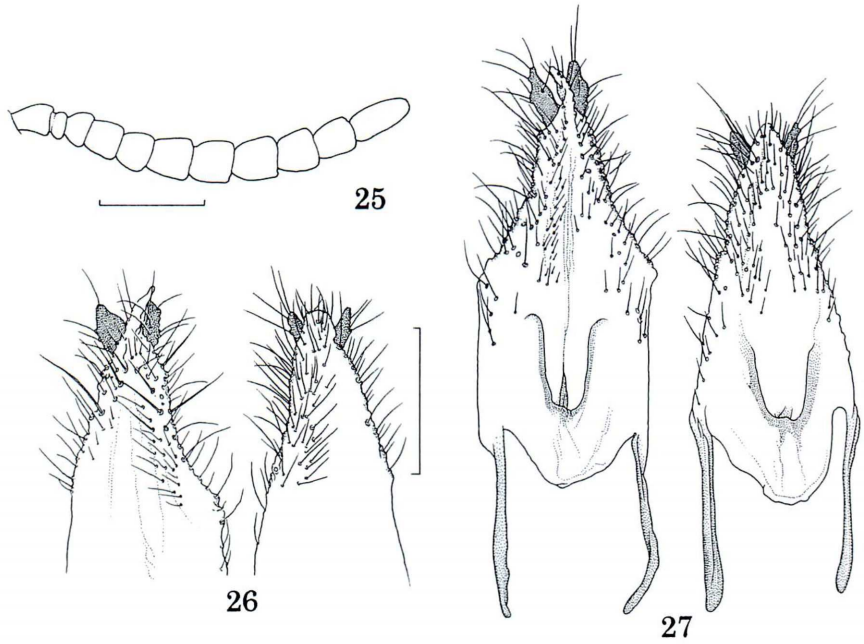


Fig. 24. Adult female (moderately long-winged individual) of *Lucidina okadai* NAKANE et OHBAYASHI, 1949; dorsal view. Scale: 1.0 mm.

Scutellum (Fig. 24) elongated trapezoidal, sides convergent towards the apex in basal halves; apical half lingulate, forming rounded corners on each side.

Elytra (Figs. 21–24) fairly short and narrow, widest at humeral part or just after the humeri, narrowly marginated throughout including inner margins, becoming weakly separated towards rounded apices, clearly dehiscent in apical parts to almost whole lengths of inner margins; lateral sides almost parallel, the margin being concealed by humeri; dorsal surface distinctly rugulose, irregularly and closely punctate; each elytron with three vague costae, of which the middle one is the longest, running throughout the length of elytra, innermost one slightly shorter than the middle one, and



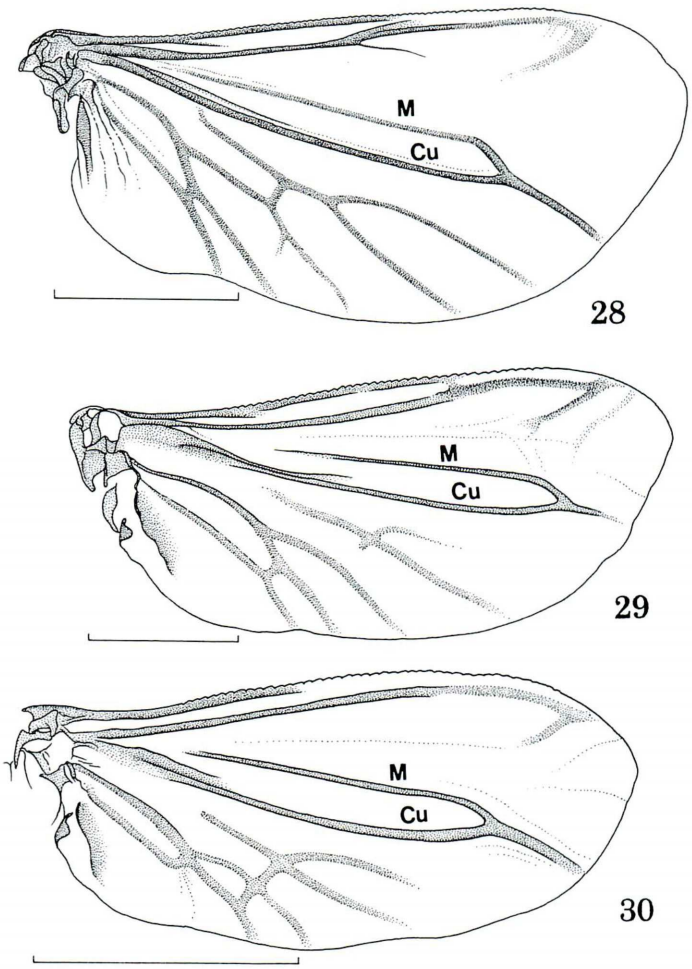
Figs. 25–27. Adult female of *Lucidina okadai* NAKANE et OHBAYASHI, 1949; right antenna, dorsal view (24); ovipositors in two individuals, dorsal view (25), ventral view (26). Scale: 0.5 mm (25), 0.25 mm (26, 27).

exteriormost one short, restricted to the distal parts of elytra, very weak and more obsolete; EL/PL 2.25–3.25 (mean: 2.55); EL/EHW 1.47–2.29 (mean: 1.79).

Hind wings (Figs. 29–30) almost the same in basic structure as those of male (Fig. 28), though relatively short and narrow (Fig. 22), membraneous area more reduced; anal area hardly expanded towards inner sides; venations inner than Cu–vain largely variable individually; confluence of M– and Cu–vains removed towards distal part as compared with that of hindwing in male; whole length of female wings almost as long as the length of elytra (Fig. 21), and never folded even in living state.

All legs (Fig. 24) fairly short and thick; trochanters relatively short, obliquely attached to femora; femora fusiform and weakly flattened dorso-ventrally; tibiae almost straight but weakly incurved at the bases, the inner and outer margins divergent towards the apices; tarsi short, 1st tarsomere the longest and clavate; 4th bilobed. Claws small, each with a minute teeth or process at the inner base, especially rather remarkable in inner claws.

Abdomen (Figs. 21, 24) relatively wider and longer than that of male, flattened dorso-ventrally, with eight visible segments on ventral side; all segments transverse; both sides feebly divergent towards 3rd or 4th segments, and then gradually convergent posteriad from 4th or 5th segment to anal end; side margins of all segments arcuately dilated laterad; both hind corners of each abdominal tergite produced posteriad as a



Figs. 28–30. Hindwing of *Lucidina okadai* NAKANE et OHBAYASHI, 1949; male (28), two female individuals (29–30), all dorsal view. Scale: 1.0 mm.

rounded process; hind margin of caudal 8th segment bisinuate, shallowly produced posteriad at the middle; apical four to five segments constantly extended and exposed to behind the level of elytral apical margin.

Ovipositor (Figs. 26, 27) individually in variable general shape, sometimes the sides are almost straight and parallel in basal halves, and then, gradually and constantly convergent towards pointed apex, sometimes devoid of parallel part basally; both dorsal and ventral surfaces densely covered with spines and relatively long setae; a pair of styli arising from just before the apex of ovipositor.

Measurement in mm. BL 4.70–6.60; HW 0.70–1.00; PL 1.00–1.40; PW 1.25–1.85; EW 0.70–1.00; EHW 1.40–2.00; EL 2.25–3.40; HTL 0.70–0.85.

General Remarks

The larva of *Lucidina okadai* is considerably similar in external morphology to that of *L. biplagiata* (MOTSCHULSKY, 1866) (KANDA, 1935; HAYASHI, 1991), which is widely distributed in Japan (Hokkaido, Honshu, Shikoku and Kyushu). However, more detailed comparison of larval morphology is still required between the two species. The coloration of larval body of the two species clearly resembles each other.

Although the food habits of the larvae in natural condition has not been clarified, they may feed on small-sized earthworms *in vitro*. This habit is common in the larvae of other congeners of the genus, *L. biplagiata* and *L. accensa* GORHAM, 1883 in Japan. Unlike the larvae of other lampyrid species, the neck region of the larva of this species is hardly expanded and nearly completely contracted. The membraneous area of the region is directly connected with the transverse line at the mid-length of the head capsule, and the head cannot be extended forwards from the level of the transverse line. On the other hand, almost whole of head capsule can be contained in the prothorax. Low elasticity of neck structure may not be favorable for eating terrestrial snails but may be adapted for eating earthworms.

The larva of *L. okadai* is basically nocturnal and shows nagative phototaxis, usualy hiding in crevices between the soil and mud. It is surmised that under natural condition, the larvae usually live in shallow part of the soil and/or in the subterranean domain. However, the larvae are generally quite active, roaming about by supporting the body using pygopods (Fig. 19).

The pygopods as the holdfast organ are also used for cleaning the surface of whole body, sometimes even of the head including mouth parts as was reported and illustrated by YANAGIHARA (1923 a, b).

General appearance of the larvae (Fig. 1) is apparently similar to that of the New World genera, *Lucidota* (BRANHAM & ARCHANGELSKY, 2000) and *Pyropyga* (ARCHANGELSKY & BRANHAM, 2000), and especially the larva of the former genus shares several features with that of *L. okadai* in the cephalic structure including that of mouth parts.

The larvae and pupae glow and emit greenish light from a pair of spotted luminescence organs of the 9th abdominal segment (Fig. 20).

The mature larva never forms soil cocoon when matamorphosing to pupa (Fig. 20).

Although the adult just after emergence has a pair of vague reddish spots on the disc of the pronotum (Fig. 21), these spots gradually disappear and are mostly pigmented to blackish areas at the final stage. Adult males hardly induce females just after emergence, but they often induce females after two or three days, and try to mount and copulate actively (Figs. 22–23). Females start ovipositing to the surface of wet soil and/or mud within one or two days after copulation. The oviposition lasts for seven or eight hours for completion, but the eggs are not laid collectively.

The males appear in the grassy and boggy field, often actively flying at the height

of grass top and sometimes among leaves and stems (OHBA *et al.*, 1996). Flight of male individuals of this species is quick and more linear than that of *L. biplagiata* (OHBA *et al.*, 1996). On the other hand, the females walk about actively *in vitro*, though there is no sign of opening elytra for taking off. Judging from the shortened and reduced elytra in adult female, and hindwings being unbalanced in size to the body, it is presumed that the flying is probably impossible.

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要　　約

川島逸郎・高井 泰：コクロオバボタルの未成熟期および雌成虫の記載．—— 岐阜県を中心に，中部地方のきわめて限られた生息地が確認されているにすぎないホタル科オバボタル属の1種，コクロオバボタル *Lucidina okadai* NAKANE et OHBAYASHI, 1949 における，幼虫期（1齢および終齢），蛹期および雌成虫の外部形態について，初めて詳細に記載・報告した．なお，かつて本種の記載より遡ること26年も前に，やはり岐阜県から，柳原 (1923 a, b) によって「コバネボタル」または「小翅蛍」と名付けられて報告されたホタルの種は，その記述と挿図から判断してコクロオバボタル *L. okadai* の可能性がきわめて高いと推定されていた（中根，1983；大場ほか，1996）．しかし，柳原による報告の直後から，複数の研究者によって，この正体不明のホタルは，本州では普遍的に分布するオバボタル *L. biplagiata* MOTSCHULSKY の羽化不全による奇形個体とみなされてきた（岡田，1931；神田，1934, 1935）．コクロオバボタルそのものがきわめてまれな種で，雌成虫の確認例も不確実であったという経緯もあり，その実態は不明瞭なままであった．しかし，約80年の年月を経て，この度の研究により，雌成虫の上翅および後翅がともに短縮しており，柳原の報告が事実であることを追認できた．本論文では，この種と正しく確認されたものとしては初めて，雌成虫とともに幼虫期・蛹期についても併せて記載した．雌成虫には上翅，後翅ともに存在するが，体躯に対しての相対的な長さおよび面積はきわめて小さく，飛翔できないことは確実である．そのために，移動能力がきわめて限定されているか，もしくはそうした能力のないことが示唆される．結果的に，生息地はきわめて狭く限定された状況になっていると推察される．

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